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BEFORE THE BOARD OF PATENT APPEALS AND INTERFERENCES

Paper No. 26

Application Number: 09/220,970
Filing Date: December 23, 1998
Appellant(s): MILLS, RANDELL L.

MAILED

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Technology Center 2600

Jeffrey S. Melcher
For Appellant

EXAMINER'S ANSWER

This is in response to the appeal brief filed April 25, 2002.

(1) Real Party in Interest

A statement identifying the real party in interest is contained in the brief.

(2) Related Appeals and Interferences

A statement identifying the related appeals and interferences which will directly affect or be directly affected by or have a bearing on the decision in the pending appeal is contained in the brief.

(3) Status of Claims

The statement of the status of the claims contained in the brief is correct.

(4) Status of Amendments After Final

The appellant's statement of the status of amendments after final rejection contained in the brief is correct. Because there is no Final Rejection, the statement is logically correct.

However, amendments were filed on February 27, 2002 after the latest non-final rejection and were entered as paper #22.

(5) Summary of Invention

The summary of invention contained in the brief is correct.

However, Examiner likes to point out that (1) there is no pending rejection under 35 U.S.C. 112, first paragraph as stated in lines 1-2, page 4 of the present Brief and (2) the summary is just repetition of the selected independent claims and is not concise.

(6) Issues

The appellant's statement of the issues in the brief is correct.

(7) Grouping of Claims

Appellant's brief includes the following statements that each of the following groups of claims do not stand or fall together with other groups and provides reasons as set forth in 37 CFR 1.192(c)(7) and (c)(8).

(A) For purposes of the rejection of claims 61-64, 71-86, 98-113, 123-126, 138-145, 148-155, 171-174, 181-196, 208-223, 233-236, 248-255 and 258-265 under 35 U.S.C. § 112, second paragraph, in this Appeal only, all these claims stand or fall together.

(B) For purposes of the rejection of claims 127-155, 237-265, 294-298 and 307-322 under 35 U.S.C. § 101, in this Appeal only:

- claims 127-155 and 294-298 stand or fall together and do not stand or fall with any other claims;

- claims 237-265 stand or fall together and do not stand or fall with any other claim; and

- claims 307-322 stand or fall together and do not stand or fall with any other claim.

(C) For purposes of the rejection of claims 157 and 266-267 under 35 U.S.C. § 102(e) over U.S. Patent No. 6,058,206 (Kortge), in this Appeal only:

- claim 266 does not stand or fall with any other claim; and

- claims 157 and 267 stand or fall together.

(D) For purposes of the rejection of claims 271-272, 274, 276, 278, 281-283, 285-288, 290-291, 299-301, 304-309 and 312-320 under 35 U.S.C. § 102(e) over U.S. patent No. 6,173,275 (Caid), in this Appeal only:

- claims 271-272, 274, 276, 278, 281-283, 287, 290-298, 304-309 and 312-320 stand or all together;

- claims 271-272, 274, 276, 278, 281-283, 285, 290-291, 299-301 and 304-306 stand or fall together;

- claims 271-272, 274, 276, 278, 281-283, 285-288, 290-291, 299, 301, 304-309 and 312-320 stand or fall together;

- claims 271, 272, 274, 276, 278, 281-283, and 307-320 stand or fall together;

- claims 271, 272, 274, 276, 278, 281-283, 285-288, 290-291, 299-301, and 304-306 stand or fall together;

- claims 271, 272, 274, 278, 281-283 and 307-320 stand or fall together; and

- claims 271-272, 274, 276, 278, 281-283, 285-288, 290-291, 299, 301, 304-309 and 312-320 stand or fall together.

(E) For purposes of the rejection of claims 158-159 and 268-269 under 35 U.S.C. § 103(a) over Kortge as applied to claims 157 and 267 above, and further in view of U.S. patent No. 5,724,487 (Streit), in this Appeal only: all claims 158-159 and 268-269 stand or fall together.

(F) For purposes of the rejection of claims 279-280, 289, 292-293, 302-303 and 321-322 under 35 U.S.C. § 103 over Caid as applied to claims 271, 281, 291, 299 and 320 above, and further in view of Streit, in this Appeal only:

- claims 279-280, 289, 292-293, and 302-303 stand or fall together; and
- claims 279-280, 289, 292-293, 302-303 and 321-322 stand or fall together.

(G) For purposes of the rejection of claims 156, 270, 273, 275 and 284 under 35 U.S.C. § 103 over Caid in view of Dickhaus et al., "Classifying Biosignals with Wavelet Networks," IEEE Engineering in Medicine and Biology, September/October, 1996, pages 103-111 (hereinafter "Dickhaus"), in this Appeal only: all clams 156, 270, 273, 275 and 284 stand or fall together.

(H) For purposes of the rejection of claims 51-54, 57-60 and 118-120 under 35 U.S.C. § 103 over H. Greenspan, et. al., "Texture Analysis via Unsupervised and Supervised Learning," IJCNN-91 -Seattle International Joint Conference on Neural Networks, 1991, Vol. 1, pages 639-644 (hereinafter "Greenspan"), in this Appeal only: all claims 51-54, 57-60 and 118-120 stand or fall together.

(I) For purposes of the rejection of claims 55, 87-90, 114, 117, 160-165, 167-170, 197-200, 224 and 227-230 under 35 U.S.C. § 103 over Greenspan in view of Kortge, in this Appeal only:

- claim 55 does not stand or fall with any other claim;
- claims 160-162-165 and 167-170 stand or fall together;
- claim 161 does not stand or fall with any other claim;
- claims 87-90, 114, 117 and 227 stand or fall together;
- claim 87 does not stand or fall with any other claim;
- claims 117 and 227 stand or fall together;
- claim 224 does not stand or fall with any other claim;
- claims 197-199 stand or fall together;
- claims 228-230 stand or fall together.

(J) For purposes of the rejection of claim 56 under 35 U.S.C. § 103 over Greenspan as applied to claim 51 above, and further in view of Streit, in this Appeal only, claim 56 does not stand or fall with any other claim.

(K) For purposes of the rejection of claims 115-116, 166 and 225-226 under 35 U.S.C. § 103 over Greenspan and Kortge as applied to claims 114, 160 and 224 above, and further in view of Streit, in this Appeal only: all claims 115-16, 116 and 225-226 stand or fall together.

(L) For purposes of the rejection of claims 65-66, 69-70, 91, 94-95 and 21 under 35 U.S.C. § 103 over Greenspan in view of Dickhaus, in this Appeal only:

- claims 65-66, 69-70, 91 and 94-95 stand or fall together;
- claims 65, 66, 69 and 70 stand or fall together; and
- claims 91, 94 and 95 stand or fall together.

(M) For purposes of the rejection of claims 175-176, 201, 203-205 and 231 under 35 U.S.C. § 103 over Greenspan and Kortge in view of Dickhaus, in this Appeal only;

- claims 175-176, 201, 203-205 and 231 stand or fall together;
- claims 175 and 176 stand or fall together;
- claims 201, 203-205 and 231 stand or fall together; and
- claims 175-176, 201 and 203-205 stand or fall together.

(N) For purposes of the rejection of claims 92 and 93 under 35 U.S.C. § 103 over Greenspan and Dickhaus, and further in view of U.S. Patent No. 5,337,264 (Levien), in this Appeal only, claims 92 and 93 stand or fall together.

(O) For purposes of the rejection of claim 202 under 35 U.S.C. § 103 over Greenspan, Kortge and Dickhaus, and further in view of Levien, in this Appeal only, claim 202 does not stand or fall with any other claim.

(8) Claims Appealed

The copy of the appealed claims contained in the Appendix to the brief is correct.

(9) ***Prior Art of Record***

6,173,275	Caid	1-2001
6,058,206	Kortge	5-2000
5,724,487	Streit	3-1998
5,337,264	Levien	8-1994

H. Greenspan et al., "Texture Analysis via Unsupervised and supervised Learning," IJCNN-91-Seattle International Joint Conference on Neural Networks, 1991, vole. 1, pages 639-644.

Dickhaus et al., "Classifying Biosignals with Wavelet Networks," IEEE Engineering in Medicine and Biology, September/October, 1996, pages 103-111.

(10) ***Grounds of Rejection***

After reviewing the Appellant's arguments, the Examiner withdrew some of the rejections set forth in the latest non-final rejection (paper #17.) Appeal to the withdrawn rejections is thus mooted.

To simplify the appeal process, the Examiner only presents below the ground(s) of the maintained rejections for the appealed claims.

(A) Claims 307-322 are rejected under 35 U.S.C. 101 because the claimed invention is directed to non-statutory subject matter.

The claimed invention is a computer related invention. The Computer-Implemented Invention Guidelines issued by the U.S. Patent and Trademark Office describe the procedures for examining such inventions. A flow chart of the procedures was attached at the end of paper #17.

For Claims 307-322, we examined them according to box 6 in the flow chart. The step in box 6 is to determine whether the invention as defined by the claims falls within one of the three following categories of unpatentable subject matter: (1) Functional descriptive material such as a data structure per se or a computer program per se, (2) Non-functional descriptive material such as music, literary works or pure data, embodied on a computer readable medium; or (3) A natural phenomenon such as energy or magnetism. *The invention as defined by Claims 307-322 is a data structure per se and therefore is non-statutory.*

(B) Claims 157 and 267 are rejected under 35 U.S.C. 102(e) as being anticipated by Kortge (US patent 6,058,206.)

With regard to Claim 157, Kortge teaches a method for recognizing a pattern. The method comprises:

-- a.) generating an activation probability parameter based on a prior activation probability parameter and a weighting based on the activation rate of the corresponding component;

-- b.) storing the activation probability parameter;

-- c.) generating a probability operand based on the activation probability parameter;

-- d.) if the probability operand is a desired value, activate any component of the group recited in Claim 157, wherein a pattern is recognized when the operand is the desired value;

-- e.) repeating steps a) -d) until a pattern is recognized.

(The passage from column 12, line 3 to column 13, lines 30 teaches all of the steps a) -e). The probability is used to calculate the index of the most probable class. The index is a considered as probability operand. The index is computed based on the Bayes Rule. For example, the passage in column 7, lines 18-24 teaches a situation the index is "yes" for outputting the most probable symbol.)

Claim 267 is medium claims covering similar limitations of Claim 157. Kortge teaches a computer-readable medium to store data and processing steps. (column 9, lines 2-23)

(C) Claims 271-272, 274, 276, 278, 281-283, 285-288, 290-291, 299-301, 304-309, and 312-320 are rejected under 35 U.S.C. 102(e) as being anticipated by Caid et al. (US patent 6,173,275.)

Caid teaches:

-- receiving data representative of physical characteristics within an input context of the physical characteristics and transforms the data into a Fourier series in Fourier space; (column 5, lines 1-16; column 5, line 61 to column 6, line 14; The wavelet transformation transforms data into Fourier series.)

-- receiving a plurality of the Fourier series from the memory, recognized a pattern, forms a string comprising a sum of Fourier series, and storing the string in a memory; (column 6, lines 42-67; The neural network has the associated layer. Each atom is a string comprising a sum of wavelet series.)

-- receiving the string, orders the wavelet series, forms complex ordered strings, and stores complex ordered strings; (column 10, lines 9-61; The summary vectors are the complex ordered strings.)

-- retrieving multiple ordered strings, forms complex ordered strings, stored the complex ordered strings, and activates the components of any of the layers of the system to recognize a pattern and establish an ordered formatted pattern; (column 12, line 18 to column 13, line 34)

-- a memory comprising a set of initial ordered Fourier series, multiple ordered strings, and complex ordered strings; (Column 3, lines 55 to column 4, line 2; column 6, lines 15-30; The feature vectors are the set of initial ordered Fourier series. In a computer, they are stored in a memory.)

-- sampling and modulating at least two of the Fourier series with at least two filters to form the modulated Fourier series; (column 5, lines 61-67; Caid teaches generating features with Gabor wavelet transformation. It is well known in the art that Gabor wavelet transformation has the recited properties as discussed below in section related to Greenspan's paper.)

-- causing an activation of an associated Fourier components based on activation probability; (column 7, lines 14-30)

-- associating plurality of Fourier series based on a probability distribution; (column 7, lines 14-30; column 12, lines 7-44)

-- coupling based on spectral similarity. (column 4, lines 26-49; column 12, lines 7-44)

For medium claims, Caid further teaches:

-- a computer medium; (column 3, line 55 to column 4, lines 25)

-- program code means embedded in the computer readable medium. (column 3, line 55 to column 4, lines 25; the software components)

The Examiner likes to point out that the storage of strings in a tree structure recited in column 10, line 21 to column 13, line 40 discloses the concept of string, ordered string, and complex strings discussed in the present application. The processing steps lead to their recognition and arrangement teach the features of the above claims. The data structure of parent-child relationship discussed is in a tree hierarchically order of relative degree of association. The determination of frequency-of-occurrence for determining feature vectors is a process related to history.

Caid's teaching with regard to Claim 304 is more specifically discussed below. Caid teaches a computer program product for use in a system for recognizing a pattern in information comprising data, said computer program product comprising:

a computer readable medium (column 3, line 55 to column 4, lines 25) having stored thereon program code means (column 3, line 55 to column 4, lines 25; the software components), said program code means comprising:

means for receiving data, and to encode said received data as parameters of a plurality of Fourier series in Fourier space, said plurality of Fourier series including input context of said data; (column 5, lines 1-16; column 5, line 61 to column 6, line 14; Features are the encoded parameters of Fourier series because the parameter specifies the Fourier series. As discussed above, $G(x', y', k_x, k_y, \sigma)$ are the features. The wavelet transformation transforms data into Fourier series. A set of data for an orientation is considered to be a series. The (x_i and y_j) are the contexts.)

means for associating Fourier series together to form a string; (column 5, lines 1-16; column 5, line 61 to column 6, line 14; Features of eight orientations are combined to form a feature vector. The eight series are related to the same sample point and is therefore associated. A feature vector is a string.)

means for ordering said string based on a relative degree of association of order formatted subsets of said string with relevant aspects of information of a standard string to form an ordered string; (column 10, lines 9-61) and

means for forming a complex ordered string from a plurality of ordered strings, said complex ordered string representing a historical association and order of processed and stored information to thereby allow recognition of a pattern in information. (column 10, lines 9-61; column 12, lines 18 to column 13, line 34)

(D) Claims 158-159 and 268-269 are rejected under 35 U.S.C. 103(a) as being unpatentable over Kortge as applied to Claims 157 and 267 above, and further in view of Streit (US patent 5,724,487.)

Kortge teaches the parental Claims 157 and 267 as discussed above. Although the result of the Bayes rule can be an index of "1" when feature is classified as the identified class and "0", if not. However, Kortge does not teach explicitly using "0" and "1" as probability operands.

Streit teaches using "0" and "1" as probability operands for classification results. (column 5, lines 1-26) In which, the probability operand is selected from a set of zero and one with the desired value to be one.

It is desirable to facilitate a subsequent logic operation after classification process. It is well known in the art using symbols "0" and "1" can facilitate the logic process. It would have

been obvious to one of ordinary skill in the art, at the time of the invention, to use "0" and "1" as probability operands taught by Streit for the result of classification process taught by Kortge, because the combination facilitates a subsequent logic operation for further action.

(E) Claims 279-280, 289, 292-293, 302-303, and 321-322 are rejected under 35 U.S.C. 103(a) as being unpatentable over Caid as applied to Claims 271, 281, 291, 299, and 320 above, and further in view of Streit (US patent 5,724,487.)

Caid teaches the parental Claims 271, 281, 291, 299, and 320 as discussed above. Although the result of the classification rule can be an index of "1" when feature is classified as the identified class and "0", if not. However, Caid does not teach explicitly using "0" and "1" as probability operands.

Streit teaches using "0" and "1" as probability operands for classification results. (column 5, lines 1-26) In which, the probability operand is selected from a set of zero and one with the desired value to be one.

It is desirable to facilitate a subsequent logic operation after classification process. It is well known in the art using symbols "0" and "1" can facilitate the logic process. It would have been obvious to one of ordinary skill in the art, at the time of the invention, to use "0" and "1" as probability operands by Streit for the result of classification process taught by Caid, because the combination facilitates a subsequent logic operation for further action.

(F) Claims 156, 270, 273, 275, and 284 are rejected under 35 U.S.C. 103(a) as being unpatentable over Caid et al. (US patent 6,173,275) in view of Dickhaus et al ("Classifying

Biosignals with Wavelet Networks" by Dickhaus et al, IEEE Engineering in Medicine and Biology, September/October, 1996, pages 103-111.)

With regard to Claim 156, Caid teaches a system for recognizing a pattern and establishing an order formatted pattern. The system comprises:

-- an input layer that receives data representative of physical characteristics within an input context of the physical characteristics and transforms the data into a Fourier series in Fourier space; (column 5, lines 1-16; column 5, line 61 to column 6, line 14; The wavelet transformation transforms data into Fourier series.)

-- a memory comprising a set of initial ordered Fourier series; (Column 3, lines 55 to column 4, line 2; column 6, lines 15-30; The feature vectors are the set of initial ordered Fourier series. In a computer, they are stored in a memory.)

-- an association layer that receives a plurality of the Fourier series from the memory, recognized a pattern, forms a string comprising a sum of Fourier series, and storing the string in a memory; (column 6, lines 42-67; The neural network has the associated layer. Each atom is a string comprising a sum of wavelet series.)

-- a string ordering layer that receives the string, orders the wavelet series, forms complex ordered strings, and stores complex ordered strings; (column 10, lines 9-61; The summary vectors are the complex ordered strings.)

-- a predominant configuration layer that receives multiple ordered strings, forms complex ordered strings, stored the complex ordered strings, and activates the components of any of the layers of the system to recognize a pattern and establish an ordered formatted pattern. (column 12, line 18 to column 13, line 34)

For Claims 273, 274, and 284, Caid teaches their corresponding parental claims as discussed above.

However, Caid does not teach that the input context is encoded in time as delays corresponding to modulation of the Fourier series at corresponding frequencies.

It is well known, in the art of image data processing, that sequential read-out is a common and obvious step for reading out an image data.

Dickhaus teaches that a wavelet transformation encodes locations (the input context) of the data in time as delays as recited in the claim as evidently shown in Equations (1a)-(1c). In the paper, the shift parameter is a time variable and is encoded with the frequency f.

It is desirable to have flexibility of performing wavelet processing with various input formats, including the most common sequential reading of image data. It would have been obvious to one of ordinary skill in the art, at the time of the invention, to include sequential reading of data for extract features by wavelet processing by Caid, because this inclusion provides operation flexibility. In the combination, a wavelet transformation inherently encodes locations (the input context) of the data in time as delays as taught by Dickhaus.

With regard to Claim 270, Caid further teaches a computer program product to carry out the above method and comprises:

-- a computer medium; (column 3, line 55 to column 4, lines 25)

-- program code means embedded in the computer readable medium. (column 3, line 55 to column 4, lines 25; The software components)

(11) Response to Argument

(A) General response to arguments with regard to rejection based on the prior art

One of Appellant's key arguments is whether the cited references teach features associated with Fourier series. One example of the arguments is shown at the last paragraph of page 54 of the Brief.

As explained below, the Examiner made different interpretations of the features from those of the Appellant. The different interpretations are the essential bases to many rejections presented in the latest non-final rejection (paper #17) and in the present Examiner Answer.

The Appellant's specification defines "Fourier series" in scope of various breaths:

-- A specific scope is given by the equation (hereafter referred as Equation A) defined in page 8, lines 19-29.

-- A broader scope is given in page 7, lines 14-16: "The input layer 12 received the data within the input context and transforms the data into the Fourier series in Fourier space representative of the information." It just mentions "Fourier series in Fourier space representative of the information."

It is very clear that Claim 61 recites the specific scope. However, its parent Claim 51 shall be read broader because Claim 61 shall further limit Claim 51. The broader interpretation of Fourier series and its associated parameters can be and shall be read broader than those set by Equation A.

In the Brief (1st paragraph of page 55 as example), the Appellant declared that the specific scope is a non-limiting example for explaining how data can be transformed into Fourier series. Further in the specification (lines 8-9, page 9), the Appellant states that only parameters

related to a Fourier series need to be stored to represent the Fourier series. Evidently, (1) the Appellant's scope of a Fourier series is not limited by Equation A, (2) a Fourier series can be represented by a series of parameters without need of storing the structure of a Fourier series, and (3) the series of parameters when used in a broader scope need not be defined the same as those in Equation A. More specifically, for those claims without reciting the Equation A, it is appropriate to interpret a Fourier series in any conventional way broader than that defined by Equation A.

The Examiner has indicated allowability in paper #17 for each claims defined by specific scope by reciting Equation A. In the Brief, the Appellant argues that the Examiner's cited references does not teach Fourier series defined similarly to Equation A as counter points of the related art rejections. This is not a valid argument when the involved claims are read with broader scope.

Discussed below are differences between features associated with Fourier series defined by Equation A and those defined conventionally.

The Appellant has defined a Fourier series in a specific scope. Applicant's explanation, of (1) a Fourier series defined by Equation A and (2) coding related to the series, was recorded in paper #17 and is given below.

On June 6, 2001, Examiner Chen had an interview with Mr. Jeffrey S. Meicher, Dr. Randell L. Mills, and Mrs. Jeffrey A. Simenauer. Examiner Chen thanks Dr. Mills for explaining the implementation of the steps by using the data obtained from the CCD array as an example. Dr. Mills stated that *the procedure disclosed in page 8 is not the conventional Fourier transform. The encoding procedure is to use input data to generate parameters. The parameters are then used to generate the function described by the equation shown in page 8. In the equation,* k_z *and* k_ρ *are independent variables of the function which is a wave function. The end result is Fourier series of some*

function related to the input data. The step of "encoding" is just associating the input data with the function as specified by the equation. Signal representing the function can be used for correlation later on.

In the example, Dr. Mills explicitly made the following statements:

-- The "m" is an index to a CCD element, say element m.

-- $N_{m\rho 0}$, N_{mz0}, ρ_{0m}, and z_{0m} are derived from the amplitude of signal generated at the element m or the rate of change of the signal.

-- With the derived $N_{m\rho 0}$, N_{mz0}, ρ_{0m}, and z_{0m}, a Fourier component is generated.

-- M is the number of CCD elements used for the processing. Each Fourier component is also indexed with a "m."

-- The combination of the M Fourier components forms a Fourier series.

This defines a specific scope. The input data are encoded (or transformed) into $N_{m\rho 0}$, N_{mz0}, ρ_{0m}, and z_{0m} that are used in Equation A to form products with the independent variables k_z and k_ρ.

Conventional Fourier series, which can be used in a broader scope, are defined very differently. One of conventional Fourier series corresponding to the Appellant's series is given as Eq. (3.2-9) in page 45 of the book "Digital Image Processing, Rafael C. Gonzalez et al., Addison-Wesley Publishing Company, 1977.) A corresponding Fourier series expressed in cosine transform is given as Eq. (3.5-49b) in page 103 of Gonzalez. The equations are shown below:

When images are sampled in a square array we have that $M = N$ and

$$F(u, v) = \frac{1}{N} \sum_{x=0}^{N-1} \sum_{y=0}^{N-1} f(x, y) \exp[-j2\pi(ux + vy)/N] \qquad (3.2\text{-}9)$$

for $u, v = 0, 1, 2, \ldots, N-1$, and

$$f(x, y) = \frac{1}{N} \sum_{u=0}^{N-1} \sum_{v=0}^{N-1} F(u, v) \exp[j2\pi(ux + vy)/N] \qquad (3.2\text{-}10)$$

for $x, y = 0, 1, 2, \ldots, N-1$.

$$C(u, v) = \frac{1}{2N^3} \sum_{x=0}^{N-1} \sum_{y=0}^{N-1} f(x, y)[\cos(2x + 1)u\pi][\cos(2y + 1)v\pi] \quad (3.5\text{-}49b)$$

for $u, v = 1, 2, \ldots, N - 1$, and

$$f(x, y) = \frac{1}{N} C(0, 0) + \frac{1}{2N^3} \sum_{u=1}^{N-1} \sum_{v=1}^{N-1} C(u, v)[\cos(2x + 1)u\pi][\cos(2y + 1)v\pi] \quad (3.5\text{-}50)$$

for $x, y = 0, 1, \ldots, N - 1$.

In both equations, (1) u and v are spatial-frequency variables, (2) x and y are position parameters, and (3) f(x,y) are measured values at position (x,y). Because f(x,y) are used to generate C(u,v) with the sine and cosine functions, and C(u,v) are considered to be coded based on f(x,y). In a broader scope in which claim langrage can be read on a conventional Fourier transform, the f(x,y) are the input data and C(u,v) are the coded parameters. This is different from the definition provided by the Appellant in the specification.

As shown, the Fourier series specified by Equation A is very different from Fourier series of a conventional definition. The Appellant called the series specified by Equation A Fourier series because they involve cosine functions. Therefore, in view of the Appellant's own definition, any series involving exp(ikx), sin(kx) or cos(xk) is considered a Fourier series. Based on the extended definition, a series generated with wavelet transform is also a Fourier series as discussed below.

It is well known in the art that Gabor wavelet transformation is given by

$$G(x', y', k_x, k_y, \sigma) = \Psi(x-x', y-y', k_x, k_y, \sigma)*I(x,y) \quad (1)$$

where I(x,y) is inputted image data and * denotes linear convolution over the variable x and y, and x' and y' is the center of a sampling window. In equation (1), k_x and k_y are frequencies and

are independent variables. At a given point (x', y'), $G(x', y', k_x, k_y, \sigma)$ varies with k_x and k_y. When Equation (1) is sampled at discrete points, it becomes

$$G(x', y', k_x, k_y, \sigma) = \Sigma\Sigma\ I(x_i, y_j) \exp(-\pi[(x_i-x')^2 \alpha^2 + (y_j-y')^2\beta^2])\exp(-2\pi i[(k_x (x_i - x') + k_y (y_j - y')])$$

$$= \Sigma\ \Sigma\ \exp(-\pi[(x_i-x')^2 \alpha^2 + (y_j-y')^2\beta^2])\exp(2\pi i[(k_x x') - k_y y')]) \{I(x_i, y_j) [\cos(2\pi(k_x x_{i+} k_y y_i)) - i \sin(2\pi(k_x x_{i+} k_y y_i))]\} \quad (2)$$

where the summation is over all location x_i and y_j. The sampling is done in spatial space (x_i and y_j).

Equation (2) in a broad sense is a Fourier series because it is expressed as sum involving exp(ikx), sin(kx) or cos(xk). *The Fourier series is represented by the $G(x', y', k_x, k_y, \sigma)$ coefficients in different orientation representing by (k_x, k_y) and scale representing by σ.* The interpretation of the $G(x', y', k_x, k_y, \sigma)$ coefficients as Fourier series in essential to the rejections to be discussed below.

(B) The Appellant argued in section 9(IV) of the Brief that "the rejection of claims 127-155, 237-265, and 294 under 35 U.S.C. § 112, second paragraph, at paragraph 9, on page 6 of the Office Action, is mooted by the amendment filed with the Brief."

Examiner's response -- The Examiner agrees with the Appellant's statement. The Examiner withdrew the "§ 112, second paragraph" rejection.

(C) The Appellant argued in section 9(V) of the Brief that "Claims 61-64, 71-86, 98-113, 123-126, 138-145, 148-155, 171-174, 181-196, 208-223, 233-236, 248-255, and 258-265 fully

comply with 35 U.S.C. § 112, second paragraph." The Applicant argues that the claims have to be read in view of specification. Especially, the Appellant pointed out that one skilled in the art would easily recognize how to build a Fourier series parameterized according to the data as disclosed wherein each Fourier component has frequency as the variable rather than time like the prior art. The parameters derived from the data are substituted into the Fourier series formula as discussed in page 44 of the present Brief.

Examiner's response -- The arguments with the above clarification are persuasive. The Examiner withdrew the "§ 112, second paragraph" rejection.

(D) The Appellant argued in section 9(VI) of the Brief that "Claims 127-155, 237-265, 294-298, and 307-322 fully comply with 35 U.S.C. § 101."

Examiner's response:

(d1) For Claims 127-155, 237-265, and 294-298, the Examiner withdrew the "§ 101" rejections to these claims.

Claims 127-155 and 294-298 recite methods that can be implemented with a computer. Claims 237-265 recite computer-readable media that comprises instructions to be executed by a computer. The Appellant pointed out in page 47 of the Brief that all the claims recite the active step "a pattern in information has been recognized." The recited methods, including those to be implemented by the recited media, for pattern recognition are not for merely carrying out an abstract idea or merely a mathematical algorithm. The arguments are persuasive.

(d2) For Claims 307-322, the Examiner maintains the 35 U.S.C. § 101 rejection. As pointed out in the previous Office Action, the rejection is based the conclusion that *Claims 307-322 is a non-functional data structure per se.*

Claims 307-322 only recite data structures stored in memories. They are pure data, not containing any algorithm. The arguments in reference to Federal Circuit cases (State Street Bank & Trust Co. v. Signature Financial Group, Inc., 47 USPQ 2d 1596 (Fed. Cir. 1998) and AT&T Corp. v. Excel Comm. Inc., 50 USPQ 2d 1447 (Fed. Cir. 1999)) are dealing with algorithm and are mooted with regard to Claims 307-322 that contain no algorithm.

The Appellant cited the *In re Lowry* case to argue that the claims are patentable subject matter under section 101. However, the Federal Circuit made decision in the case on the questions related to rejections under 35 USC 102(e) and 103. In the case, Federal Circuit did not express opinion on rejection under 35 USC 101. Therefore, the citation to the decision in *In re Lowry* case is irrelevant to the 101 rejection to Claims 307-322 of the present application.

The data structure recited in Claims 307-322 comprises a collection of data objects. Claim1 referred in the case of In re Lowry, 32 USPQ 2d 1031, 1035 (Fed. Cir. 1994) (now US patent 5,664,177) recites data structure. Because the claim dictates how application programs manage information, Lowry's Claim 1 defines *functional* characteristics of the memory (32 USPQ 2d 1034.) The *functional* characteristics make it patentable. However, the data structure of Claims 307-322 in the pending application does not control any computer program. The data structure is results of a collection of recognized patterns and their probabilities. Although the data structure is not static, it is passive data. It does not have any *functional* characteristics. The "activation of a data object" can be broadly interpreted just as "reading a data from a memory."

The data structure is similar to the data compiled for a banking-account software. When a button on a computer screen is selected, data are read (activated) and displayed.

In summary, the data structure recited in Claims 307-322 is passive in nature. It does not provide active function to change the software. Therefore, the invention as defined by Claims 307-322 is a non-functional data structure per se and therefore is non-statutory.

(E) The Appellant argued in section 9(VII) of the Brief that "Claims 157 and 266-267 are patentable under 35 U.S.C. § 102(e) over U.S. Patent No. 6,058,206 (Kortge)."

(e1) Claim 266 recites the use of "ordered strings comprising Fourier series." The Appellant argued that the Examiner has failed to even attempt to show how Kortge teaches the use of ordered strings comprising Fourier series. In any case, Kortge does not disclose the use of such ordered strings comprising Fourier series and, thus, cannot anticipate claim 266.

Examiner's response -- The Examiner agrees with the statement. Rejection to Claim 266 is withdrawn.

(e2) For Claims 157 and 267, the Appellant argued that Kortge cannot anticipate the claimed invention since it does not identically show each claim limitation. One of the Appellant's arguments is that the present specification clearly teaches away from using neural networks and discusses the severe limitations of neural networks, such as the one disclosed in Kortge. Claims 157 and 267 recite the use of a "probability operand." Kortge does not disclose the use of a probability operand and, thus, cannot anticipate claims 157 and 267.

Examiner's response --

(e2-1) First, there are many kinds method involving neural network. As pointed out by Kortge in column 1, lines 44-58, its method is not a traditional neural network. Kortge's network is a pattern generator (column 12, lines 3-16.) In the recognition mode, the weights are not updated. The most important point is that, Kortge teaches every limitation recited in Claims 157 and 267. In other word, Claims 157 and 267 recite no feature that will exclude reading of the claims from any neural network.

(e2-2) With regard to the issue of probability operand, Kortge teaches in column 12, lines 27-49:

> The classifier 34, combines likelihood values (via well known Bayes Rule) with prior class probabilities, to obtain the (relative) posterior class probability information. From this information it computes the index of the most probable class, which it communicates via the output signal 36.

In column 7, lines 18-24, Kortge teaches that the effector 38 receives the index and take some action 70. For example, the effect is the act of storing an ASCII representation of the most probable character. In the whole process, the determination of a most probable class is either "yes" or "no" which can be considered as a probability operand because it generates output based on probability. The operand has posterior class probability information as its input and inherently has "yes" or "no" for a most probable class as its output. Therefore, the operation has the index as operand to indicate "yes" or "no" of a most probable class. In the operation, when the output is "yes" for character "A" for example, the "A" is inherently recognized and its ASCII representation is stored. The output "yes" is considered to be "the desired value."

The Examiner is entitled to give the broadest reasonable interpretation to the language of the claims. The Examiner is not limited to Applicants' definition which is not specifically set

forth in the claims. In re Tanaka et al., 193 USPQ 139, (CCPA) 1977. Therefore, with above explanation, Kortge's teaching meets all the requirements recited in the claims.

(F) The Appellant argued in section 9(VIII) of the Brief that "Claims 271-272, 274, 276, 278, 281-283, 285-288, 290-291, 299-301, 304, 309, and 312-320 are patentable under 35 U.S.C. § 102(e) over U.S. patent No. 6,173,275 (Caid)."

Examiner's response --

In the above Appellant's grouping, all of the claims stand or fall together with Claim 271. The Examiner selected Claim 304 as the representative claim for response. Because Claim 271 stands or falls together with Claim 304, if Claim 304 falls Claim 271 will also fall. Because all of the above listed claims stand or fall together with Claim 271, if Claim 271 falls, all of the above listed claims will fall, too.

Caid teaches Claim 304 that recites a computer program product for use in a system for recognizing a pattern in information comprising data, said computer program product comprising:

a computer readable medium (column 3, line 55 to column 4, lines 25) having stored thereon program code means (column 3, line 55 to column 4, lines 25; the software components), said program code means comprising:

means for receiving data, and to encode said received data as parameters of a plurality of Fourier series in Fourier space, said plurality of Fourier series including input context of said data; (column 5, lines 1-16; column 5, line 61 to column 6, line 14; Features are the encoded parameters of Fourier series because the parameter specifies the Fourier series. As discussed above, $G(x', y', k_x, k_y, \sigma)$ are the features. The wavelet transformation transforms data into

Fourier series. A set of data for an orientation is considered to be a series. The (x_i and y_j) are the contexts.)

means for associating Fourier series together to form a string; (column 5, lines 1-16; column 5, line 61 to column 6, line 14; Features of eight orientations are combined to form a feature vector. The eight series are related to the same sample point and is therefore associated. A feature vector is a string.)

means for ordering said string based on a relative degree of association of order formatted subsets of said string with relevant aspects of information of a standard string to form an ordered string; (column 10, lines 9-61) and

means for forming a complex ordered string from a plurality of ordered strings, said complex ordered string representing a historical association and order of processed and stored information to thereby allow recognition of a pattern in information. (column 10, lines 9-61; column 12, lines 18 to column 13, line 34)

(f1) For this group of claims, the Appellant argued that the claimed invention is not a neural network and therefore is different from the teaching of Caid. As shown, Caid teaches every limit of Claim 304. Therefore, Claim 304 as recited is not distinguishable from the teaching of the reference Caid. In other word, Claim 304 recites no feature that will exclude reading of Claim 304 from any neural network.

(f2) The Appellant argued that Caid does not teach "Fourier series in Fourier space," in which frequency is a variable as recited in Claim 304. Caid indeed teaches features derived from wavelet transform in column 5, lines 1-16; column 5, line 61 to column 6, line 14. As discussed in section 11(A) above, the features are the encoded parameters of Fourier series because the

parameter specifies the Fourier series. A wavelet transform is represented as a Fourier series in Fourier space in which frequency is a variable.

(f3) The Appellant argued that Caid's data cannot be transformed according to the non-limiting example described on page 8, line 19 through page 9, line 9. As pointed out in section 11(A) above, reading to Claim 304 is not limited to interpretation of the non-limiting example. Because Claim 304 does not recite the specifics of the non-limiting example, Caid's transform does not need to be the same as shown in the example.

(f4) The Appellant argued that Caid's wavelet transformation is very different from that taught by Appellant. The Examiner agrees that Caid's wavelet transformation is very different from the non-limiting example. However, Claim 304 recites a broader transform. Caid's wavelet transformation meets the recited requirement as explained in section 11(A) above.

(f5) The Appellant argued that Caid's context cannot be encoded. In a conventional coding using Fourier transform, a set of data is encoded by C(u,v) or $G(x', y', k_x, k_y, \sigma)$. The meaning of encoding defined in the present application is very different from a conventional definition. As shown in section 11(A) above, in an interview, the Applicant defined "encoding" as "substituting data value or context as parameters of a series of functions." As shown in section 11(A) above, in wavelet transform, the x_i and y_j, which are the context information, are used as parameters in Equation (2) above. Therefore, according to the Appellant's own definition, the context is also encoded.

(f6) The Appellant argued that Caid fails to (1) disclose a method of ordering information to form new information and (2) teach the recited ordered string and complex ordered strings. In Caid, features of eight orientations are combined to form a feature vector. Each prototype feature vector, which is called an atom, is considered by the Examiner as a string because the vector is

described by a string of vector components. The eight series are related to the same sample point and is therefore associated. The atom is then related with a high-dimensional context vector. (column 6, line 65 to column 7, line 4) The context vector is also considered as a string, because it is also described by a string of vector components. The context vectors in the learning stage are generated and ordered with the bootstrapping process as shown in column 9, line 1 to column 10, line 8. The ordering is based on a relative degree of association of the target atom and its neighboring atoms. The end result of the bootstrapping process is an arrangement of context vectors of the atoms in the high-dimensional space. Because the arrangement is not random, but depends on the spatial relationship and co-occurrence of the atoms, the modified context vectors and their associated prototype feature vectors are ordered. (column 5, lines 1-16) The modified context vectors are considered by the Examiner as the ordered strings. The context vectors are then used to form a summary vector that combines all the context vectors associated with the atoms that comprise an image. As shown in column 10, lines 47-61, Caid teaches that the summary vectors are stored in a tree structure that also provides ordering information. Because the context vectors and atoms are generated through learning. The tree represents a historical association and order of search (process.) The tree is used for retrieving information by comparing a summary vector of an image with the summary vectors stored in the tree structure. It teaches recognition of a pattern in information. The summary vector and the tree represent the complex ordered string.

The Examiner is entitled to give the broadest reasonable interpretation to the language of the claims. The Examiner is not limited to Applicants' definition which is not specifically set forth in the claims. In re Tanaka et al., 193 USPQ 139, (CCPA) 1977. Therefore, with above explanation, Caid teaches a product that meets all the requirements recited in Claim 304.

(G) The Appellant argued in section 9(VIX) of the Brief that Claims 158-159 and 268-269 are patentable under 35 U.S.C. § 103(a) over Kortge as applied to claims 157 and 267 above, and further in view of U.S. patent No. 5,724,487 (Streit).

Examiner's response -- The Appellant argued that Streit dose not overcome the deficiencies of Kortge with regard to rejection to the parent Claims 157 and 267. As discussed above in section 11(e2) above, there are no deficiencies of Kortge. The Examiner maintains the original rejections.

(H) The Appellant argued in section 9(X) of the Brief that Claims 279-280, 289, 292-293, 302-303 and 321-322 are patentable under 35 U.S.C. § 103 over Caid as applied to claims 271, 281, 291, 299 and 320 above, and further in view of Streit.

Examiner's response -- The Appellant argued that Streit dose not overcome the deficiencies of Caid with regard to rejection to the parents of the listed claims. As discussed above in section 11(F) above, there are no deficiencies of Caid. The Examiner maintains the original rejections.

(I) The Appellant argued in section 9(XI) of the Brief that Claims 156, 270, 273, 275, and 284 are patentable under 35 U.S.C. § 103 over Caid in view of Dickhaus et al., "Classifying Biosignals with Wavelet Networks," IEEE Engineering in Medicine and Biology, September/October, 1996, pages 103-111 (hereinafter "Dickhaus").

Examiner's response -- The Appellant argued that Dickhaus dose not overcome the deficiencies of Caid with regard to rejection to the parents of the listed claims. As discussed

above in section 11(F) above, there are no deficiencies of Caid. The Examiner maintains the original rejections.

(J) The Appellant argued in section 9(XII) of the Brief that Claims 51-54, 57-60, and 118-120 are patentable under 35 U.S.C. § 103 over H. Greenspan, et al., "Texture Analysis via Unsupervised and Supervised Learning," IJCNN-91 -Seattle International Joint Conference on Neural Networks, 1991, Vol. 1, pages 639-644 (hereinafter "Greenspan".)

Examiner's response -- The Appellant argued that each of claims 51-54 and 57-60 recite the use of filters, "sampling at least one of said Fourier series in Fourier space with a filter to form a sampled Fourier series" and "modulating said sampled Fourier series in Fourier space with said filter to form a modulated Fourier series." Claims 118-120 also recites the use of filters, "forming associations between at least two of the Fourier series by modulating and sampling the Fourier series with filters." Greenspan does not teach or suggest such steps utilizing filters. The Gabor transforms taught by Greenspan comprise time modulated and frequency shifted filters. In contrast, the filters of Appellant modulate the Fourier series in Fourier space.

The Examiner has answered to the Appellant's arguments such as those related to the use of neural network and the use of Fourier series for pattern recognition above.

While a Fourier series can be represented by the coefficients of a Fourier series, for sampling and modulating the series in Fourier space one has to write explicitly the Fourier series in a function form such as that given by Equation A. Then one can sample and modulate the function in frequency (Fourier) domain. Therefore, the Examiner agrees with the Appellant that Greenspan does not teach the limitations

-- "**sampling** at least one of said **Fourier series** ***in Fourier space*** **with a filter** to form a sampled Fourier series" and "**modulating** said **sampled Fourier series** ***in Fourier space*** **with said filter** to form a modulated Fourier series" recited in claims 51-54 and 57-60;

-- "**forming associations** between at least two of the Fourier series **by modulating and sampling the Fourier series with filters**."

As a consequence, the Examiner withdraws the rejection of Claims 51-54, 57-60, and 118-120 under 35 U.S.C. § 103.

(K) The Appellant argued in section 9(XIII) of the Brief that Claims 55, 87-90, 114, 117, 160-165, 167-170, 197-200, 224, and 227-230 are patentable under 35 U.S.C. § 103 over Greenspan in view of Kortge.

Examiner's response -- The Examiner withdraws the rejection to the claims because of withdrawal of Claim 51 that relies on Greenspan reference as indicated in section 11(J) above.

(L) The Appellant argued in section 9(XIV) of the Brief that Claim 56 is patentable under 35 U.S.C. § 103 over Greenspan as applied to claim 51 above, and further in view of Streit.

Examiner's response -- The Examiner withdraws the rejection to the claim because of withdrawal of Claim 51 that relies on Greenspan reference as indicated in section 11(J) above.

(M) The Appellant argued in section 9(XV) of the Brief that Claims 115-116, 166, and 225-226 are patentable under 35 U.S.C. § 103 over Greenspan and Kortge as applied to claims 114, 160, and 224 above, and further in view of Streit.

Examiner's response -- The Examiner withdraws the rejection to the claims because Greenspan reference fails to teach the features recited in the claims as indicated in section 11(J) above.

(N) The Appellant argued in section 9(XVI) of the Brief that Claims 65-66, 69-70, 91, 94-95, and 21 are patentable under 35 U.S.C. § 103 over Greenspan in view of Dickhaus.

Examiner's response -- Claim 21 is not pending as indicated by the Appellant. The numeral 21 is a typo. It shall be changed to 121. The Examiner withdraws the rejection to the claims because of withdrawal of Claims 51 and 114 that rely on Greenspan reference as indicated in section 11(J) above.

(O) The Appellant argued in section 9(XVII) of the Brief that Claims 175-176, 201, 203-205 and 231 are patentable under 35 U.S.C. § 103 over Greenspan and Kortge in view of Dickhaus.

Examiner's response -- The Examiner withdraws the rejection to the claims because Greenspan reference fails to teach the features recited in the claims as indicated in section 11(J) above.

(P) The Appellant argued in section 9(XVIII) of the Brief that Claims 92-93 are patentable under 35 U.S.C. § 103 over Greenspan and Dickhaus, and further in view of U.S. Patent No. 5,337,264 (Levien).

Examiner's response -- The Examiner withdraws the rejection to the claims because of withdrawal of Claim 51 that relies on Greenspan reference as indicated in section 11(J) above.

(Q) The Appellant argued in section 9(XIX) of the Brief that Claim 202 is patentable under 35 U.S.C. § 103 over Greenspan, Kortge and Dickhaus, and further in view of Levien.

Examiner's response -- The Examiner withdraws the rejection to the claim because Greenspan reference fails to teach the features recited in the claim as indicated in section 11(J) above.

For the above reasons, it is believed that the rejections as indicated should be sustained.

Respectfully submitted,

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